

# PATENT SPECIFICATION



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## PROVISIONAL SPECIFICATION.

### Improvements relating to the Balancing of Pistons.

I, Sir HERBERT AUSTIN, K.B.E., of Lickey Grange, Bromsgrove, in the County of Worcester, a subject of the King of Great Britain, do hereby declare the nature of this invention to be as follows:—

As is well known, in the case where a piston is connected to a crank pin by a connecting rod, the movement of the piston in the cylinder is not harmonic for the reason that the angle attained by the connecting rod in relation to the cylinder axis is a varying one, so that the average speed of the piston during the first half of its inward movement is slower than during the last half of the stroke. This inharmonic movement tends to interfere with the balance of the engine, as it cannot be compensated for simply by a revolving balance weight.

According to one form of the invention the difficulty is overcome or greatly reduced by the provision of a bob weight in the plane of rotation and connected by a lever to a point relatively far out from the cylinder axis so that the weight moves in a comparatively flat curve which lies substantially along the said axis and the weight is connected by a link also to the crank pin or big end of the connecting rod. The position of the weight is such that the said link, when the piston is at the inner end of its stroke, lies in an extension of the axis of the connecting rod.

According to another form of the invention, in lieu of employing a link, the bob weight is guided by a suitable guide in a line with the axis of the cylinder or parallel thereto.

The effect of the weight in either case is to act as a dummy piston and it serves to compensate for the inharmonic movement of the piston itself because the faster half stroke of the piston corresponds with the slower half stroke of the weight. The system does not provide endwise balance, but this is effected either by a revolving weight in the usual way with single cylinder engines, or simply by the other piston or pistons of multicylinder engines, such other pistons also having compensating weights as above described.

The weight may be rigidly mounted upon the lever above mentioned or it may be pivoted to the lever and be rigid with the link. The lever should be as long as it conveniently can, because the longer the lever is the nearer the movement of the weight approximates to a straight line.

Dated this 28th day of April, 1925.

STEPHEN, WATKINS, SON & GROVES,

Chartered Patent Agents,  
Metropolitan Chambers, Wolverhampton,  
Agents for the Applicant.

## COMPLETE SPECIFICATION.

### Improvements relating to the Balancing of Pistons.

I, Sir HERBERT AUSTIN, K.B.E., of Lickey Grange, Bromsgrove, in the County of Worcester, a subject of the King of Great Britain, do hereby declare the nature of this invention and in what manner the same is to be performed, to be

particularly described and ascertained in and by the following statement:—

As is well known, in the case where a piston is connected to a crank pin by a connecting rod, the movement of the piston in the cylinder is not harmonic because of the angularity of the connecting rod, and the average speed of the piston during the first half of the outward stroke is faster than during the last half of the stroke. This inharmonic movement tends to interfere with the balance of the engine, as it cannot be compensated for simply by a balance weight on the crank shaft.

According to this invention the difficulty is overcome, or greatly reduced, by the provision of a bob weight connected to the crank pin or to the connecting rod and placed in the line of the cylinder axis or parallel thereto, or substantially so, and positioned on the opposite side of the crank pin to the cylinder. The bob weight is connected to the crank pin or to the main connecting rod by an auxiliary connecting rod and the latter is preferably shorter than the main connecting rod as in such case the balancing effect can be obtained with a bob weight whose mass is less than that of the piston, whereby the weight of the engine need not be unduly increased.

The bob weight may be guided in suitable guides, or it may be linked by a relatively long link or set of links to a lateral fixed point. In the latter case the movement of the bob weight is not precisely in the extended axis of the cylinder, but it can be given a sufficiently near approximation thereto by providing a sufficiently long link or links.

The effect of the bob weight in either case is to act as a dummy piston and it serves to compensate for the inharmonic movement of the piston itself because the faster half stroke of the piston corresponds with the slower half stroke of the bob weight. The system does not provide endwise balance, but this is effected either by a revolving weight in the usual way with single cylinder engines, or simply by the other piston or pistons of multicylinder engines, such other pistons also having compensating bob weights as above described.

In the case of a bob weight which is linked, it may be in pivotal relationship either to its link or links or to its connecting rod, or to both.

In order that the invention may be clearly understood a practical application thereof as applied to guided bob weights is described with reference to the main figures of the drawings herewith of

which Figures 1, 2 and 3 are respectively a side elevation, plan and end view except that certain parts are shown in section.

Figure 4 is a diagrammatic view to illustrate the application of the invention to a bob weight which is linked laterally to a fixed point.

Referring first to Figures 1, 2 and 3, A is the crank shaft of a four-cylinder internal combustion engine and B each of the main connecting rods thereof. To the lower end of each connecting rod B, and at a point H below the crank pin, is provided a short connecting rod C which, at its lower end, is pivoted to a bob weight D. Each bob weight is guided in the line of its respective cylinder axis by a pair of guides E E.

In Figure 4 the guides E E are replaced by the link F which is pivoted to the bob weight D and also pivoted to a fixed point G of the crank case.

As is well known in a four-cylinder engine, the descending pistons during the first half of their stroke are travelling faster than the ascending pistons are travelling and this is balanced in the above described construction because the bob weights of the descending pistons, during the same period are travelling slower than those attached to the ascending pistons. Owing to the two facts that the connecting rods are shorter than the connecting rods B and that the upper pivot centre H of each connecting rod C is somewhat outwards of the centre of the crank pin, due to such pivot centre being below the crank pin, the bob weights may be considerably lighter than the pistons.

Having now particularly described and ascertained the nature of my said invention and in what manner the same is to be performed, I declare that what I claim is:—

1. Means for balancing, or compensating for, the inharmonic movement of a piston which is coupled to a crank pin by a connecting rod, comprising a bob weight arranged to move in, or substantially in, the line of the cylinder axis or parallel thereto, and on the opposite side of the crank shaft thereto, and a connecting rod connected to the bob weight at one end and at the other pivoted to the crank pin or to the main connecting rod.

2. In means as claimed in Claim 1, the provision that the said connecting rod of the bob weight is shorter than the main connecting rod.

3. In means as claimed in Claim 1, or in Claim 2, the provision that the connecting rod of the bob weight is pivoted

to a point on the main connecting rod which is outwards of the crank pin.

4. In means as claimed in any of the preceding claims, the said bob weight  
5 guided in guides so as to move in the line of the cylinder axis or parallel thereto.

5. In means as claimed in any of Claims 1 to 3, the said bob weight linked to a  
10 fixed point which is relatively far out in a direction at right angles to the cylinder axis.

6. Means for balancing, or compensating for, the inharmonic movement of a  
15 piston substantially as described with

reference to Figures 1 to 3 of the drawings herewith.

7. Means for balancing, or compensating for, the inharmonic movement of a piston, substantially as described with  
20 reference to Figure 4 of the drawings herewith.

Dated this 28th day of January, 1926.

STEPHEN, WATKINS, SON &  
GROVES,

Chartered Patent Agents,  
Metropolitan Chambers, Wolverhampton,  
Agents for the Applicant.

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[This Drawing is a reproduction of the Original on a reduced scale.]

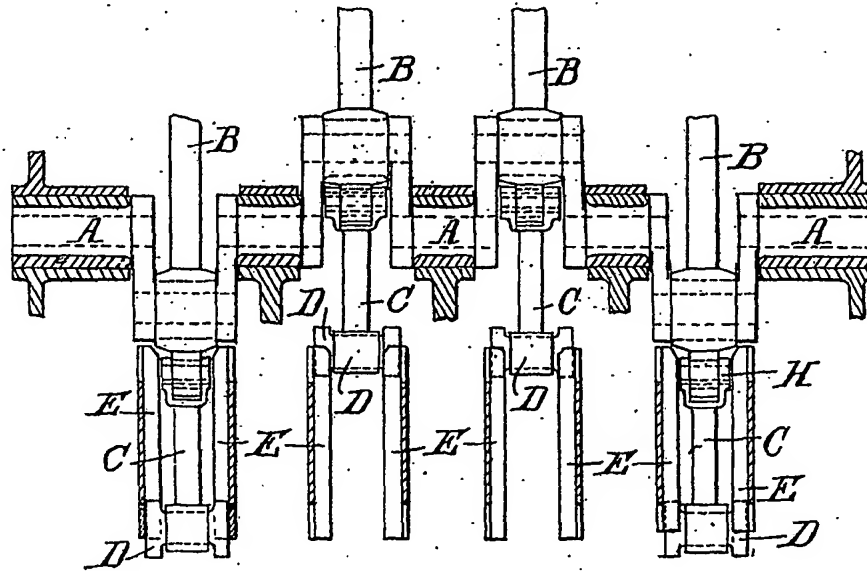


Fig. 1.

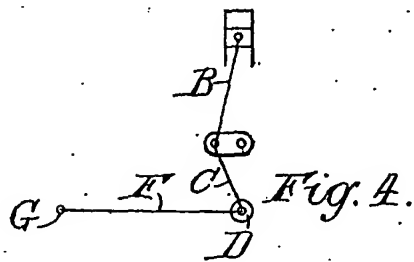


Fig. 4.

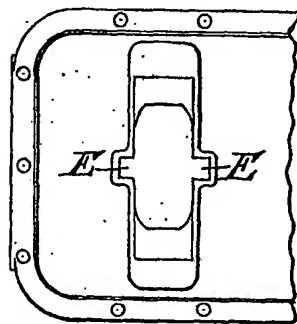


Fig. 2.

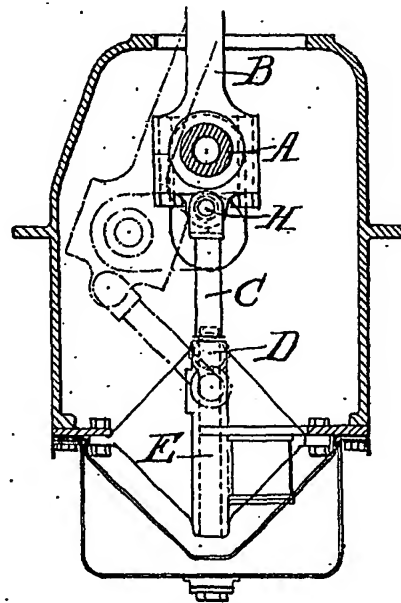


Fig. 3.